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PROTEIN AND AMINO ACID CONTENTS OF GREEN ALGA *BOTRYOCOCCUS BRAUNII* (CHLOROPHYCEAE, CHLOROCOCCALES)*

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ABSTRACT - Protein and amino acid content of green alga *Botryococcus braunii* has shown that essential amino acids are in balanced proportion except methionine. Total protein content of the alga is less as compared to other protein rich algae.

RÉSUMÉ - La teneur en protéines et acides aminés de l'algue verte *Botryococcus braunii* montre qu'il existe un équilibre entre les acides aminés, à l'exception de la méthionine. La teneur en protéine totale de cette algue est inférieure à celle rencontrée chez d'autres espèces riches en protéines (traduit par la rédaction).

KEY WORDS : Chlorophyta, *Botryococcus braunii*, protein, amino acid.

INTRODUCTION

Botryococcus braunii Kützing, a hydrocarbon producing unicellular colonial green alga has received much attention these days due to the fact that it may provide a renewable source of compounds usuable as fuels or feedstocks (Largeau *et al.*, 1980; Wake & Hillen, 1980 and Chirac *et al.*, 1985). The alga is slow growing in nature as well as in culture conditions (Swale, 1968; Belcher, 1968; Casadevall *et al.*, 1985). A perusal of the literature has shown that protein and amino acid contents of this alga are not known. It is the purpose of this communication to present some data on its protein and amino acid contents.

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MATERIALS AND METHODS

Botryococcus braunii was obtained from the University of Texas culture collection (No 572). The alga was grown in a modified Chu No 10 medium with soil extract (5%) and M-6 trace elements. The culture was grown in 500ml. "Borosil" gas washing bottles with 250ml. medium in each flask. The light (16hrs) was provided by three fluorescent tubelight of 40 watt each (51.1579μE m^{-2} s^{-1}). The cultures were aerated by means of an aquarium pump during light phase only under aseptic conditions After the growth period of 15 days, the aliquot was filtered and dried at 40°C. Other details are similar to those described earlier (Ahmad, 1988).

Table 1 - Protein and Amino acid contents of *Botryococcus braunii*. (g/100g protein).

Aspartic acid	7.6
Threonine	5.2
Serine	5.2
Glutamic acid	11.9
Proline	6.1
Glycine	8.5
Alanine	9.7
Cystine 2	-
Valine	7.0
Methionine	0.9
Isoleucine	4.0
Leucine	8.2
Tyrosine	2.1
Phenylalanine	4.0
Histidine	1.5
Lysine	3.6
Ammonia	6.7
Arginine	7.9
Protein %	11.8

The algal sample was digested with 1 N NaOH at 100°C for an hour and the total protein determined in the filterate by Lowry's method (1951). For the determination of amino acid contents, 25mg. of the algal powder was hydrolysed with 6 N HCl at 104-110° for 24 hours in a sealed tube. After the completion of hydrolysis, HCl was removed under vacuum. The hydrolysate was dissolved in sodium citrate buffer (pH 2.2). Amino acid analysis was done on ■ LKB 4101 au-

tomatic amino acid analyser using ninhydrine for developing colour of various amino acids passing through the colourimeter assembly.

RESULTS AND DISCUSSION

The amino acid contents of *Botryococcus braunii* is given in Table I. The amino acids have been reported as g 100g protein depending on the protein content determined by the Lowry's method. From the present investigations it is evident that values of some important essential amino acids: lysine (3.6), leucine (8.2), phenylalanine (4.2), valine (7.0) and histidine (1.5) is in balanced proportion, but deficient in methionine. The total protein (11.8%) is very much less as compared to other green algae, *Chlorella* (55.5%). A comparison of the amino acid contents of *Botryococcus braunii* with those of blue-green alga *Spirulina*, FAO standard, *Chlorella* and eggs indicated that lysine and methionine content is less as compared to FAO standard (table II). In other essential amino acids, the figure is almost similar to FAO standard. The sulphur containing amino acids are also deficient in other algae like protein rich *Spirulina platensis*.

Table II - Essential Amino acids (g 100g protein) of *Spirulina*, FAO standard, Egg, *Chlorella* and *Botryococcus braunii*.

Essential Amino acids	*Spirulina* (Fox, 1987)	FAO standard (Fox, 1987)	Egg (Fox, 1987)	*Chlorella* (Lubitz, 1962)	*Botryococcus* (present work)
Isoleucine	6.4	4.0	5.8	3.55	4.0
Leucine	10.4	7.0	9.0	4.05	8.2
Lysine	4.9	5.5	6.7	7.80	3.6
Methionine + Cystine	3.3	3.5	5.1	2.03	0.9
Phenylalanine + Tyrosine	10.4	6.0	9.6	7.71	6.1
Threonine	5.4	4.0	5.3	3.42	5.2
Tryptophane	1.5	1.0	1.8	1.50	-
Valine	7.5	5.0	7.2	5.76	7.0
Protein %	65.0		31.2	55.5	11.8*

* Protein percentage calculated against a known standard eg. egg albumen.

In view of its slow growth in nature as well as in cultural conditions, it may not be possible to utilize the alga for mass culture but due to its hydrocarbon producing nature, it will be a good material for further biological study.

It may be concluded from tables I and II that there are some variations in amino acids in *Botryococcus braunii* protein, but from a nutritional point of view, the amino acids are fairly balanced although deficient in some.

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